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Improving Risk Communication in Government: Research Priorities

Caron Chess,[1] Kandice L. Salomone,[1] and Billie Jo Hance[1]

Despite the increased interest in risk communication among government agencies, there is evidence that agencies' risk communication practices lag. We conducted a study to explore which risk communication research would be most important to improve government agencies' risk communication practices. Qualitative interviews and a survey of 145 risk communication experts based in academic institutions and government agencies explored how important research on each of 48 topics would be to improving agencies' risk communication efforts. Respondents identified topics within three areas as priorities for further research: 1) involving communities in agency decision-making; 2) communicating with communities of different races, ethnic backgrounds, and incomes; and 3) evaluating risk communication. Both practitioners and researchers responded to additional statements about agencies' risk communication practices with reservations about staff and managers' commitment to effective communication about environmental issues. We discuss the implications of these findings.

KEY WORDS: Risk communication; risk perception; government; public participation; evaluation; environmental equity.

INTRODUCTION

Government agencies are increasingly concerned about how to communicate with the public more effectively about environmental issues. When policy initiatives, regulations, and other activities seem headed for conflict between agencies and outside interests, the imperative to avoid environmental gridlock grows.[1] Agencies also have been pushed to take communication more seriously when confronted with environmental problems that require changes in individuals' behavior, such as reducing radon in homes, decreasing solid waste, and limiting automobile use.[2–5]

The growing interest in risk communication is marked by the proliferation of risk communication training for staff at federal, state, and local government agencies. The Environmental Protection Agency took the lead at the federal level in developing a two-day risk communication course in 1987 that has reached thousands of EPA personnel. A seminar for EPA managers was also piloted in 1991.[6] The Agency for Toxic Substances and Disease Registry (ATSDR), which is responsible for health studies at Superfund sites, has funded national trainings for state health officials.[7] Even the United States Department of Energy (DOE), long known for its culture of secrecy,[8] has developed policies about communication[9] and has initiated efforts to train environmental restoration staff.

Local government agencies are also seeking to upgrade risk communication expertise. In 1991, The National Association of County Health Officials (NACHO) surveyed 350 county health departments about environmental health issues and found that risk communication training ranked as the number two training priority among respondents.[10] As a result, NACHO has conducted nine risk communication workshops around the country to meet this demand.

[1] Center for Environmental Communication, Rutgers University, Cook College, Box 231, New Brunswick, New Jersey 08903.

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Manuals, brochures, and workbooks aimed specifically at agency officials are also proliferating.[11-14] Yet, a great deal of anecdotal evidence and some empirical research indicate that agencies' risk communication practices lag significantly behind their interest. For example, one study found that, notwithstanding stated commitments to risk communication, state health agencies' practices were limited and mostly reactive in nature.[15] A study of the New Jersey Department of Environmental Protection found a similar gap between staff and managers' philosophies and actual communication practices.[16]

The question we explore is: What risk communication research would be most important to improve agencies' risk communication practices? This question has not been examined in any detail. Even the National Research Council's seminal review of the field includes only a brief outline of research needs, without a sense of priorities.[17]

There are many factors other than risk communication research (e.g., management support, resources, training) that are critical to making risk communication part of agency routine. However, we believe that research has an important role to play, just as it does in other aspects of agency practice. Moreover, given limited funds for risk communication research, our goal is to provide agencies and other researchers with a sense of priorities that might help build a more coherent body of risk communication research of use to government.

METHODOLOGY

The risk communication field is diverse. Agency practitioners of environmental risk communication are found at all levels of government and in a variety of different settings. Researchers conducting studies related to risk communication represent a range of disciplines (e.g., sociology, geography, psychology, communication, economics). Although there has been no attempt to define the boundaries of the field nor to develop a comprehensive professional listing of those involved, we were committed to developing a methodology that would identify research priorities based on a range of perspectives in the field. To do so, we used both qualitative and quantitative methods.

To form the basis of a questionnaire that identifies research priorities, we conducted short telephone interviews with 12 agency practitioners and 12 academic researchers who are leaders in the field and who, as a group, represented the disciplinary diversity of the field. Open-ended interview questions were designed to yield: 1) respondents' perspectives on agency risk communication problems and successes; 2) research topics critical to improving agency practice; and 3) suggestions for names of other risk communication practitioners and researchers whose perspectives would be important to include in the study.

Using summaries of these 24 interviews, we derived 48 research topics for the questionnaire. Respondents were asked to rate the importance of each research topic for improving agency risk communication using a 6-point scale where "1" represented a response of "not at all important" and "6" represented "extremely important."

During the initial interviews, experts also raised concerns about agency practice that could not easily be stated as research topics (e.g., value of research, role of training, management commitment). We translated these concerns into issue statements about agency practice. Respondents indicated the extent of agreement or disagreement with these issue statements on an 8-point scale where "1" represented "strongly disagree" and "8" represented "strongly agree."

A pre-test questionnaire was reviewed for clarity, comprehensiveness, and ease of completion by ten researchers and practitioners not involved in the project, and then revised.

We sent the questionnaire to our original group of 24 experts as well as the snowball sample of academics and practitioners that they recommended. In all, 145 questionnaires were distributed (in three versions to account for order effects) to 65 risk communication researchers and 80 risk communication practitioners. Following a second mailing to non-respondents, completed questionnaires were returned by 120 respondents including 54 researchers and 66 practitioners, an 83% response rate overall and for each group separately.

Respondents included practitioners in all ranks of county, state, and federal agencies dealing with environmental and health issues and researchers in a variety of institutions and a range of disciplines. Although we know our snowball sample does not include all risk communication experts, we feel confident that the diversity of the field is represented.

RESULTS

Research Topics

To classify the 48 research topics into three categories of high, medium, and low importance, we cal-

Table I. Research Topics with Means Statistically Higher than the Grand Mean (4.21) (Practitioners and Academics Combined)

Topic	Mean	SD
Involving communities		
Integrating social, political, economic, and values-based concerns into agency decision-making	4.87	1.29
Usefulness of different approaches to shared decision-making	4.76	1.25
Building community consensus beyond active participants	4.68*	1.16
Communicating with different social and cultural groups		
Communicating effectively to different social groups in the US, e.g., cultural, ethnic, or racial groups	4.87	1.27
Defining needs of minority communities for participation in environmental problem solving	4.60	1.43
Effect of culture on individuals' perception of risk	4.59	1.32
Ways to sensitize agency staff to the needs of minority communities	4.48	1.47
Evaluating risk communication		
Documentation and evaluation of risk communication successes and failures	4.80	1.25
Determining the informational wants and needs of an audience	4.76	1.37
Development of effective evaluation methods	4.71*	1.18
Relative effectiveness of different communication messages, strategies, and channels	4.56*	1.42
Other topics		
How laypeople process risk communication messages	4.80	1.26
Determining how and why individuals and societal and cultural groups confer (or withdraw) trust in people and organizations	4.62	1.46
The impact of media messages on risk perception	4.42	1.29

* Research topics where the responses of academics and practitioners were significantly different.

Table II. Research Topics with Means Statistically Lower than the Grand Mean (4.21) (Practitioners and Academics Combined)

Topic	Mean	SD
Explaining risk communication		
Relative effectiveness of different ways of expressing probability	3.73	1.38
Evaluating the effectiveness of comparing lifestyle risks to technological risks	3.33	1.68
Managing risk communication		
Effect of different spokespeople on perceptions of risk (e.g., risk managers vs. community relations experts vs. agency "mouth pieces")	3.80	1.37
Approaches to prioritizing agency risk communication efforts	3.64	1.43
Organizational structure of a model risk communication program in an agency	3.59*	1.54
Theory-building		
Development of a theoretical model for community decision-making based on sociological research	3.53	1.59
Development of a theoretical model for risk communication based on communication research	3.50	1.54
Development of a theoretical model for individual decision-making based on psychological research	3.25	1.37
Other topics		
The process of individuals' knowledge formation and how that impacts their environmental decision-making	3.96	1.40
Effect of communication strategies on individuals with strongly held beliefs vs. those without strongly held beliefs	3.65	1.27

* Research topics where the responses of academics and practitioners were significantly different.

culated the grand mean across all research topics and all respondents and then compared the means of individual research topics to the grand mean. Although pre-test results indicated that a 6-point scale ranging from (1) "not at all important" to (6) "extremely important" would provide acceptable variation among respondents, the 120 study participants who returned questionnaires tended not to choose responses of (1) or (2). This pattern suggests that practitioners and researchers in our study tended to feel that all 48 research topics were at least somewhat important. Nevertheless, even within this more limited range of responses (lowest mean = 3.25, highest mean = 4.87) the means of 24 research topics were found to differ significantly from the grand mean. Fourteen of these 48 research topics had ratings statistically higher than the grand mean of 4.21 (Table I), 10 topics had means statistically lower than the grand mean (Table II), and 24 topics had means that were not statistically different from the grand mean (Table III).

High-Priority Topics. Eleven of the 14 research topics given the highest ratings by respondents are distributed among three areas of research: involving communi-

Table III. Research Topics with Means Not Statistically Different from the Grand Mean (4.21) (Practitioners and Academics Combined)

Topic	Mean	SD
Determining how trust can be regained	4.43	1.45
Effective ways for citizens to access information	4.38	1.43
Determining the long-term effects of risk communication	4.37	1.42
Extent of information needed for well-informed choice	4.36	1.53
Impact of new and competing information on attitudes and behavior	4.31	1.31
Using audience assessment information to develop communication strategies	4.30*	1.48
Factors that influence agencies' environmental protection of different communities	4.29*	1.45
Effect of scientific uncertainty and credibility	4.27	1.33
Basis of public opposition to specific environmental policies	4.25	1.28
Effect of risk communication efforts on the dynamics among perceptions, attitudes, and behavior	4.25	1.48
Communication that encourages environmentally responsible but unpopular behavior by individuals (e.g., reduced automobile use)	4.24	1.47
Organizational learning about risk communication, risk perception, and risk management	4.21	1.40
Factors that influence individual willingness to heed advice	4.18	1.50
Effectiveness of mediation in resolving environmental disputes	4.16	1.30
Evaluating the effectiveness of agency risk communication training	4.08*	1.40
Effect of involving agency risk communicators in agency risk management decisions	4.07*	1.52
Ethical dilemmas of agency risk communicators	4.05	1.58
Development of a theoretical model for risk communication that integrates psychological, social and communication constructs	4.04	1.81
The process of individuals' clarifying their values and how that impacts their environmental decision-making	4.03	1.46
Increasing managers' accountability for risk communication	4.01*	1.55
Public perception of government agencies that manage risks	4.00	1.30
Methods for determining when communication is the most appropriate risk management alternative	3.97	1.47
The impact of explanations of economic benefits on perception of environmental issues	3.97	1.42
Methods to increase audiences' overall understanding of science	3.97	1.60

* Research topics where the respones of academics and practitioners were significantly different.

ties in environmental decision making, communicating with different social and cultural groups, and evaluating risk communication (Table I).

Involving Communities. Three research topics which dealt with providing outside input into agency decisions elicited responses that were significantly above the grand mean: "Integrating social, political, economic, and values-based concerns into agency decision-making" (mean = 4.87); "Usefulness of different approaches to shared decision-making" (4.76); and "Building community consensus beyond active participants" (4.68).

Communicating with Different Social and Cultural Groups. Respondents also favored risk communication research that focuses on communities of different social and cultural groups. Four research topics in this category elicited responses that were significantly above the grand mean: "Communicating effectively to different social groups in the U.S., e.g., cultural, ethnic, or racial groups" (mean = 4.87); "Defining needs of minority communities for participation in environmental problem solving" (4.60); "Effect of culture on individuals' perception of risk" (4.59); and "Ways to sensitize agency staff to the needs of minority communities" (4.48).

Evaluating Communication. Research topics concerning evaluating agency risk communication efforts also rated highly: "Documentation and evaluation of risk communication successes and failures" (mean = 4.80); "Determining the informational wants and needs of audiences" (4.76); "Development of effective evaluation methods" (4.71); and the "Relative effectiveness of different communication messages, strategies, and channels" (4.56).

Other Topics. In addition, three other research topics elicited responses that were clearly above the grand mean: "How laypeople process risk communication messages" (mean = 4.80); "Determining how and why individuals and societal and cultural groups confer (or withdraw) trust in people and organizations" (4.62); and "Impact of media messages on risk perception" (4.42).

Differences Between Practitioners and Researchers

Across 48 research topics, we observed only nine significant differences between the ratings given by researchers and practitioners ($p < .05$). Yet, as the following analyses show, these differences do not necessarily

indicate that the two groups see the importance of all nine topics in radically different terms.

To determine the relevance of the differences found between researchers and practitioners on these nine items, we calculated an overall group mean across all 48 research topics for researchers and one for practitioners (overall group mean of practitioners = 4.28, overall group mean of researchers = 4.11) and then compared the individual topic means given by each group to their group's overall mean. For example, the research topic "Development of effective evaluation methods" was rated significantly higher in importance by practitioners than it was by researchers (P = 4.94, R = 4.44). However, both practitioners and researchers considered the topic quite important. The group mean of practitioners for this topic (4.94) was significantly greater than the overall group mean of practitioners (4.28). Researchers also rated the topic significantly greater than their overall group mean (group mean of topic = 4.44, overall group mean of researchers = 4.11). That is, although practitioners consider research on this topic more important than researchers do, both researchers and practitioners consider the topic more important than average.

Interestingly, researchers and practitioners did report significant differences in the importance they attach to research on four topics related to agencies' management of risk communication programs. Overall, practitioners considered research on all four management topics as more important than researchers did. The largest difference was observed for the importance of research on the "Effect of involving agency risk communicators in agency risk management decisions" (group means: P = 4.59, R = 3.41). When these means are compared to the overall group means, we find that practitioners considered this topic more important than average and researchers considered it less important than average. Three other management topics were considered of average importance by practitioners and of below average importance by researchers: "Organizational structure of a model risk communication program in an agency" (means: R = 3.04, P = 4.03); "Evaluating the effectiveness of agency risk communication training" (means: R = 3.59, P = 4.48); and "Increasing managers' accountability for risk communication" (means: R = 3.61, P = 4.32).

In addition to those already mentioned, significant differences between practitioners and researchers were observed for four other research topics. Practitioners rated two of these topics as more important than average while researchers considered them of average importance—"Relative effectiveness of different communication messages, strategies, and channels" (group means: P = 4.89, R = 4.17) and "Building community consensus beyond active participants" (group means: P = 4.94, R = 4.37). Researchers rated one topic more important than average while practitioners considered it of average importance—"Factors that influence agencies' environmental protection of different communities (group means: R = 4.59, P = 4.06)." Although practitioners rated the topic of "Using audience assessment information to develop communication strategies" as more important than researchers (group means: P = 4.55, R = 4.02), neither group rated the topic as more important than average.

Views on Agency Risk Communication

Practitioners and researchers indicated concerns about agencies' risk communication efforts in response to 18 issue statements asking for the extent of their agreement on an 8-point scale (where "1" indicated "strongly disagree" and "8" indicated "strongly agree"). Means of all issue statements are reported in Table IV. We used t-tests to detect significant differences between means of researchers' and practitioners' responses.

Respondents strongly agreed that "There is need for considerable improvement in agencies' communication about environmental risks" (mean = 7.09). They were more equivocal in response to two statements about agencies' risk communication progress: "Overall, government agencies' efforts to communicate environmental risk have improved significantly" (4.37; $p < .001$) and "Overall, government agencies' written materials about environmental risks have improved significantly" (4.33; $p < .001$).

A number of statements also probed the extent to which respondents believed that specific problems posed significant barriers to agency risk communication efforts. Respondents agreed that "Lack of management commitment to risk communication is a major obstacle to government agencies' risk communication" (mean = 5.99), but responded less strongly to a statement which asked about lack of staff commitment (5.26; $p < .01$). In response to similar statements about expertise, practitioners and academic researchers agreed that lack of management expertise and lack of staff expertise each pose a major obstacle (5.70 = management expertise; 5.71 = staff expertise). In addition, respondents agreed that "Lack of clear goals is a major obstacle to the risk communication efforts of government agencies" (5.97). They agreed, but far less strongly, that lack of resources posed a major obstacle (4.93; $p < .001$). Similarly, respondents agreed somewhat with the statement: "Gov-

Table IV. Means of Issue Statements (Practitioners and Academics Combined)

Issue	Mean	SD
There is need for considerable improvement in agencies' communication about environmental risks.	7.09	1.21
Lack of management commitment to risk communication is a major obstacle to government agencies' risk communication.	5.99	2.08
Lack of clear goals is a major obstacle to the risk communication efforts of government agencies.	5.97	1.70
Government agencies' risk communication efforts are hindered by agencies' failure to implement existing risk communication advice.	5.71*	1.67
Lack of staff expertise in risk communication is a major obstacle to government agencies' risk communication efforts.	5.71	1.66
Lack of management expertise in risk communication is a major obstacle to government agencies' risk communication.	5.70	1.89
Government agencies pay little attention to social justice issues when dealing with the public.	5.29	2.25
Lack of staff commitment to risk communication is a major obstacle to government agencies' risk communication efforts.	5.26	1.94
Lack of resources is a major obstacle to risk communication efforts of government agencies.	4.93	2.21
Risk communication training is more critical to resolving government agency problems than risk communication research.	4.86*	2.19
Advice to government agencies about risk communication (contained in manuals and other how-to materials) is not sufficiently grounded in research.	4.84*	2.00
Risk communication research should emphasize building a theoretical model of risk perception and risk communication that adequately deals with the complexity of the real world.	4.81	2.36
Government agencies' inability to compete with advocacy groups' messages is a major obstacle to agency risk communication.	4.72	2.24
The most significant barrier to government agencies' evaluation of risk communication is failure to implement existing evaluation methods.	4.37	2.13
Overall, government agencies' efforts to communicate environmental risk have improved significantly.	4.37*	1.54
Overall, government agencies' written materials about environmental risk have improved significantly.	4.33	1.60
Risk communication research should focus on solving immediate problems facing practitioners rather than on developing long-term strategies.	3.80*	2.18
The most significant barrier to government agencies' evaluation of risk communication is lack of useful evaluation methods.	3.54	2.03

* Research topics where the responses of academics and practitioners were significantly different.

ernment agencies' inability to compete with advocacy groups' messages is a major obstacle to agency risk communication" (4.72; $p < .001$).

We also probed the reasons agencies failed to evaluate their risk communication efforts. Practitioners and academics disagreed weakly with the statement: "The most significant barrier to government agencies' evaluation of risk communication is lack of useful evaluation methods" (3.54). But they agreed weakly that "The most significant barrier to government agencies' evaluation of risk communication is failure to implement existing evaluation methods" (4.37; $p < .01$).

As with research priorities, practitioners and academics agreed more than they disagreed with statements about agency practice, and the differences in means of responses were statistically significant ($p < .05$) for only five of the eighteen statements. Not surprisingly, three of these statements were tied to the role of research. Practitioners agreed far more strongly than researchers that: "Risk communication training is more critical to resolving government agency problems than risk communication research" (means: P = 5.44; R = 4.09). Practitioners agreed, while academic researchers disagreed, that: "Risk communication research should focus on solving immediate problems facing practitioners rather than on developing long-term strategies" (means: P = 4.38; R = 3.04). Academics agreed far more strongly than practitioners that "Advice to government agencies about risk communication (contained in manuals and other how-to materials) is not sufficiently grounded in research" (means: R = 5.59; P = 4.17).

DISCUSSION

We are reluctant to rank-order research topics or prescribe a one-size-fits-all-agencies research agenda based on the results of this study. Although our snowball sample represents the diversity of risk communication expertise in the United States, it is neither a census nor a random sample of a cohesive, well-defined field. In addition, the topics themselves, which were intentionally general, are in some respects risk communication Rorschach tests—some respondents saw topics very differently from others, based on their written comments on the survey. Yet, the large response rate, the diversity of respondents, and the number of comments pencilled on the survey (more than 40% of respondents added comments) suggest that our questions touched a nerve. However, no one can predict with certainty which research

findings will ultimately improve agency practice, therefore this study should not be construed as denying the worth of research topics rated as less important by respondents.

The surprising consensus among researchers and practitioners about the relative importance of research topics provides a far clearer sense of research priorities than we expected from such a diverse group of respondents. Practitioners, because they are often faced with complex environmental problems, limited resources, and hostile publics, tend to focus on finding solutions to immediate risk communication problems. Researchers, on the other hand, tend to focus on understanding and explaining the process and effects of risk communication. Yet, both groups tended to accord the same importance to research topics and to attribute the same problems to agency practice.

Great importance was accorded to research related to how agencies might interact more effectively with communities that are culturally different than white, middle–class ones. This was likely due, in part, to studies which question whether poor communities and communities of color are disproportionately burdened by environmental hazards.[18–21] The priority respondents placed on research to improve communication with such communities suggests that practitioners and researchers define communication as a part of the solution to the issues raised by these reports, (although we did not ask respondents if they concurred with the studies' conclusions about environmental inequity). However, our study suggests that risk communication researchers and practitioners were concerned with more than merely improving the exchange of information between agencies and different social and cultural groups. For example, respondents indicated the importance of research that explores ways to enhance the role of such groups and communities in environmental problem-solving, as well as research to explore ways to sensitize agency staff to the needs of such communities. Thus, practitioners and researchers defined the problem as a failure of agencies to consider these communities' concerns, not merely an inability to craft messages that are more useful or understandable to such communities.

Practitioners and researchers also stressed the importance of other research topics related to integrating outside perspectives into agency decision-making. The high means of several topics related to this issue suggest that respondents define the fundamental issue as *how*—rather than *whether*—to solicit and incorporate input. Respondents suggested more research is needed on the relative effectiveness of mechanisms to solicit input.[22–23] However, they also wanted to know more about how agencies can bring social, political, economic, and values-based concerns into agency decision-making. In other words, even if agency decision-makers solicit input effectively and listen to that input, how can they use this information? More research and experience are needed to determine how government agencies might democratize facets of their environmental decision-making processes while at the same time maintaining sufficient scientific integrity.[24]

Respondents placed great importance on research topics related to evaluation of risk communication efforts. By underscoring the importance of determining audiences' needs, practitioners and academic researchers suggested that evaluation is part of the process of developing a communication effort (formative evaluation), not merely measuring results (outcome evaluation). Although respondents placed a priority on research to develop effective evaluation methods, they did not indicate that lack of useful methods was a major obstacle to agencies' risk communication.

Follow-up interviews with practitioners who have evaluation experience reflected the complexity of issues surrounding agency evaluation. Interviewees saw evaluation as important but felt it was necessarily contingent on agencies' definition of risk communication success: Is success increasing credibility of the agency? Helping people understand information? Convincing people of the accuracy of agency studies? Soliciting input? Practitioners also suggested that their definitions of success and those of agency managers sometimes differ. Several practitioners indicated that they knew evaluation methods existed, but they did not feel the methods were easily accessible or ready-to-use. This study suggests that more effort needs to be made to determine obstacles that prevent practitioners from evaluating communication efforts, despite the importance they place on it. It may also be useful to explore practitioners' views on the strengths and limitations of existing guides to evaluation.[25–29]

The responses of practitioners and researchers to statements about agency risk communication practices raise profound organizational questions: How does an organization develop greater commitment to risk communication? How can the risk communication expertise of staff and managers be improved? What are the necessary preconditions for meaningful risk communication efforts? Organizational researchers would define these questions as researchable ones.

However, respondents placed little importance on topics related to organizational research, rating all related topics as average to low priority. Thus, respondents may not have seen the research topics on the survey as salient, even if they saw organizational issues as critical.

On the other hand, the responses may reflect the view that research won't reduce organizational barriers to risk communication. As one agency staffer put it: "We just have to get managers to commit to risk communication. What is there to research?" Overcoming organizational barriers to risk communication has received relatively little attention,[30-32] but this study suggests it merits further discussion, if not research.

Respondents' identified another potential organizational issue when they downgraded the importance of research topics relevant to explaining relative risk. Practitioners and researchers gave one of the lowest ratings to "Evaluating the effectiveness of comparing lifestyle risks to technological risks." Similarly, respondents attached little priority to research on the "relative effectiveness of different ways of expressing probability." Yet these are the very topics that technical staff and many environmental managers see as the core of risk communication.

More fundamentally, respondents called into question the role of research in improving agency practice. Training, which provides advice and skills to practitioners, was seen as somewhat more important than research. But researchers also indicated that risk communication manuals and how-to materials are not sufficiently grounded in research. In other words, while practitioners asked for more down-to-earth advice, researchers believed the current research literature does not adequately support much of the advice currently directed to practitioners, let alone provide guidance to resolve the more complex problems that confront practitioners. The differences in the opinions of practitioners and researchers may be grounded, at least in part, in their definitions of research. For example, practitioners may not be aware that their request for additional guidance is, in essence, a call for further applied research.

In our interviews, practitioners noted that they know relevant risk communication research is "out there," but they don't have the time to track it down. On the other hand, researchers indicated frustration that practitioners don't have a broad enough understanding of the field. Interestingly, both practitioners and researchers raised the need for a clearinghouse for risk communication information such as case studies, examples of materials from a variety of agencies, and evaluation research which can be applied to risk communication efforts.

Overcoming agencies' risk communication problems will require commitment from the same agencies that practitioners and researchers characterize as reluctant, if not resistant. Further risk communication research targeted to practitioners' needs is important, but it would be naive to think that such information is likely to change managers' (or staff's) commitment to communication. After all, current risk communication research (and guidance) point out that information has a limited influence on individuals' attitudes or behavior concerning environmental issues.[33] There is also a considerable body of research that suggests that changing organizations is complex. Therefore, we doubt that providing agency managers with the results of risk communication research will be sufficient to change managers' practices, let alone agencies' routines. In short, risk communication research will be necessary, but not sufficient to improve agencies' risk communication practices.

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